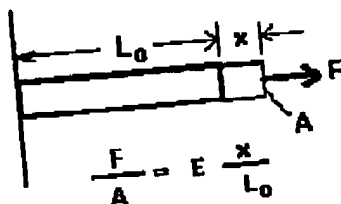


SIMPLE HARMONIC MOTION

Stress \sim Strain

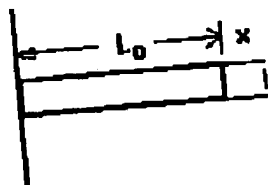
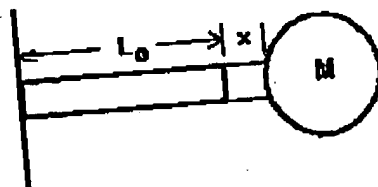
Stretch Stress	$\frac{F_{\perp}}{A}$	=	E	Stretch Strain	$\frac{\Delta L}{L}$
Shear Stress	$\frac{F_{\parallel}}{A}$	=	G	Shear Strain	$\frac{\Delta x}{L}$
Bulk Stress	$\frac{F}{A} = P$	=	B	Bulk Strain	$\frac{\Delta V}{V}$



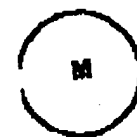
$$\frac{F}{A} = E \frac{x}{L_0}$$

$$F = \frac{AE}{L_0} x$$

$$F = kx$$



$$F = kx$$



$$-F = ma$$

$$-kx = ma$$

$$a = -\frac{k}{m}x(t)$$



$$x(t) = x_0 \cos(\sqrt{\frac{k}{m}} t) + \frac{v_0}{\sqrt{\frac{k}{m}}} \sin(\sqrt{\frac{k}{m}} t)$$

$$v(t) = v_0 \cos(\sqrt{\frac{k}{m}} t) - x_0 \sqrt{\frac{k}{m}} \sin(\sqrt{\frac{k}{m}} t)$$

$$a(t) = -\frac{k}{m} x(t)$$

$$\sqrt{\frac{k}{m}} = 2\pi f = \frac{2\pi}{T} = \omega$$

$$\text{Spring Potential Energy} = \frac{1}{2} kx^2$$

$$\text{Kinetic Energy} = \frac{1}{2} mv^2$$

$$\text{Energy} = \text{SPE} + \text{KE} = \frac{1}{2} kx^2 + \frac{1}{2} mv^2 = \text{CONSTANT } E$$

$$E = \frac{1}{2} kx_0^2 + \frac{1}{2} mv_0^2$$

$$E = \frac{1}{2} kx_{\max}^2 + 0$$

$$E = 0 + \frac{1}{2} mv_{\max}^2$$

$$E = \frac{1}{2} kx(t)^2 + \frac{1}{2} mv(t)^2$$